Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Issued October 17, 1911.

U. S. DEPARTMENT OF AGRICULTURE,

FOREST SERVICE—Circular 188.

HENRY S. GRAVES, Forester.

FOREST PRODUCTS LABORATORY SERIES.

VOLATILIZATION OF VARIOUS FRACTIONS OF CREOSOTE AFTER THEIR INJECTION INTO WOOD.

BY

C. H. TEESDALE,

Engineer in Wood Preservation.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1911.

Volatilization of Various Fractions of Creosote after their Injection into Wood.

The volatilization of creosote from timber after injection is of much importance to users of creosoted material, since the efficiency of any treatment is determined largely by the permanence of the antiseptic in the wood In an experiment conducted by the Forest Products Laboratory to determine the relative values of various fractions of coal-tar creosote in protecting piling from the attacks of marine wood borers, some interesting data on this subject were obtained. In making the test, 48 specimens of sap loblolly pine were treated with various fractions of creosote. These specimens were allowed to stand in the laboratory, open-piled, for two months or longer after the completion of the treatments, in a temperature of from 60° to 80° F. They were weighed immediately before and after treatment and at least once each week during the time they were piled in the laboratory.

The fractions of creosote were obtained by redistilling a good commercial grade of coal-tar creosote as shown in Table 1.

TABLE 1.—*Distillation limits and yields in redistillation of creosote.*[1]

Fraction number.	Distillation limits.	Yield in per cent of total amount distilled.
	° C.	
I	0–205	9
II	205–250	40
III	250–295	19
IV	295–320	4
V	Residue above 320	28

[1] Reported by the Semet-Solvay Co., from whom the redistilled creosote was purchased.

The specimens were prepared by cutting young trees between 5 and 6 inches in diameter, consisting chiefly of sapwood, into sections each 24 inches long. These were peeled and seasoned until they contained between 15 and 20 per cent of moisture. They were then divided into six groups, each group consisting of eight pieces. Groups I to V, inclusive, were treated, respectively, with the fractions designated by the same numerals. The sixth group was treated with creosote similar in composition, as shown by fractional distillation, to the creosote from which the fractions were distilled.

The loss in weight for each piece, obtained by the weekly weighings, was calculated in per cent of the total amount of antiseptic injected. The losses for the eight pieces in each group were averaged at each weighing and plotted in a time and loss curve, as shown in figure 1.

A composite curve, representing an average of all the fractions, was also made. (Fig. 1.) The values for this curve were found by multiplying the average percentage loss of each fraction by the percentage yield of the fractions in the distillation and adding the results.

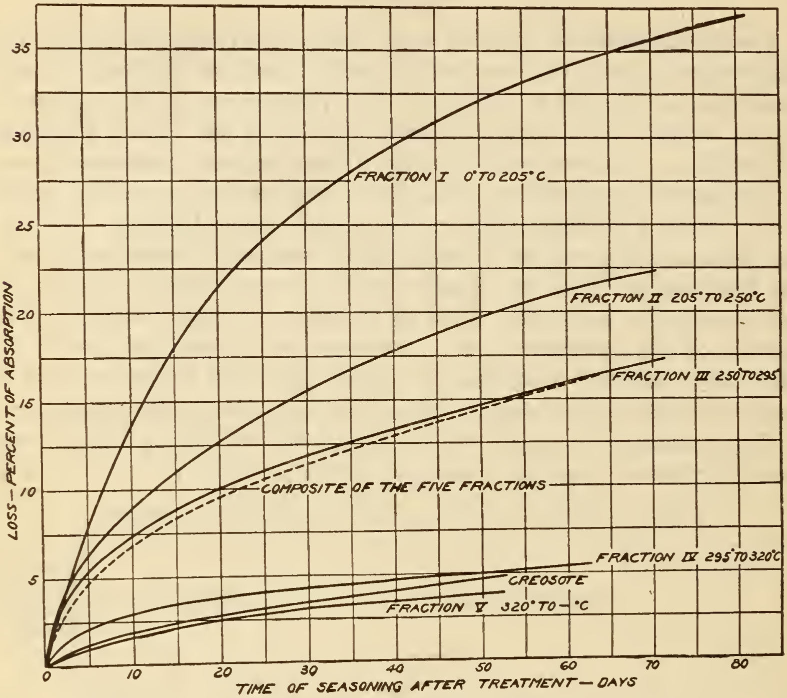

FIG. 1.—Rate of volatilization of creosote fractions and creosote from treated wood.

The sums thus computed for the consecutive weighings form the points of the curve, which gives the approximate loss which might be expected from the creosote from which the five fractions were distilled. The losses at the end of two months are shown also in Table 2.

TABLE 2.—*Volatilization of oil from wood two months after treatment.*

Fraction number.	Average absorption per cubic foot of wood.	Loss per cubic foot of wood.	Loss of average absorption.
	Pounds.	*Pounds.*	*Per cent.*
I	18.13	6.26	34.7
II	17.46	3.72	21.3
III	18.89	3.19	15.9
IV	18.16	1.12	6.2
V	15.06	.60	4.0
Composite of 5 fractions			15.8
Creosote[1]	20.80	1.13	5.4

---

[1] Similar in composition to that from which the fractions were distilled.

The lighter fractions, as might be expected, lost more than the heavier ones, but the losses for the three first are surprisingly great when compared with the commercial creosote, the latter losing only 5.4 per cent, or about the same as the two heaviest fractions.

It might be thought that some of these losses were due to loss of moisture in the wood, but this was found not to be the case. Pieces having a low moisture content often lost as much or more than pieces with a higher moisture content treated with an equal amount of the same fraction. Table 3 shows the moisture content of the wood at the time of treatment.

TABLE 3.—*Moisture content of wood at time of treatment.*

Group No.	Per cent of moisture.	Group No.	Per cent of moisture.
I	20.9	IV	18.3
II	20.7	V	17.0
III	18.2	VI	15.9

It seems from these results that the lighter fractions of creosote, when separated by distillation and separately injected into sap loblolly pine, will volatilize much more rapidly than the fractions combined in the original creosote. This might be explained by the supposition that when creosote containing both low-boiling and high-boiling oils is injected into wood, the light oils volatilize chiefly in the outer portions of the wood and leave oil that is much less volatile. The outer cells thus become more or less sealed and tend to prevent the volatilization of the lighter oils in the interior of the wood.

It is possible that with a light treatment, where the ducts and cells are not filled with creosote, but the cell walls are simply coated with oil, the tendency here noted would be very much less apparent. Nevertheless, it may be inferred that a creosote, to be of most value, at least for treating loblolly pine, should contain considerable quantities of high-boiling fractions, which appear to plug up the outer cells, and so insure the retention of the lighter oils in the interior of the wood.

Approved:
JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *August 17, 1911.*

○